

APPLICATION GUIDE FOR THE PREPARATION OF PART III  
SPECIFICATIONS - DETAILED TOLL OFFICE EQUIPMENT REQUIREMENTS

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1. GENERAL

1.01 This section is intended to provide REA borrowers, consulting engineers, contractors and other interested parties with technical information for use in the design and construction of telephone systems of REA borrowers. It covers in particular the preparation of Part III - Specifications for Toll Office Equipment, REA Form 542c.

1.02 Most REA projects involving toll offices will include one or more local dial offices and it is expected that one central office equipment contract will cover both the local and the toll requirements. Where this is not the case the present form of contract, REA Form 525, may be used for the toll office alone. In any case REA Form 542 should be filled out and attached to the contract when equipment for a toll center is required.

1.03 The objective of Part III of the Specifications is to describe the amount and arrangement of equipment that will best meet the requirements of a particular toll office.

1.04 Most of the information required for Part III of the Specifications can be obtained from exhibits of the area coverage design (ACD) relating to toll traffic, toll trunks and connecting company arrangements. The remainder can be obtained from the connecting companies involved.

1.05 The "Specifications - Toll Office Equipment" are designed primarily for "Full" toll centers, (Class 4 offices) that is, toll offices which handle all toll calls originating in the toll center area, irrespective of the point of termination. However, the same specifications may be used for "Partial Tributaries" which handle only those toll calls which terminate within a limited area. In either case provisions usually are included for handling assistance, information, intercept and repair service calls originating in the local office and tributaries.

1.06 In the preparation of this section it is assumed that the reader is familiar with the following sections of the REA Telephone Engineering and Construction Manual and with REA Bulletin 340-3; "Coordination of Borrowers' Activities With Connecting Companies."

Section 156 - Nationwide Operator Toll Dialing  
Section 205 - Preparation of an Area Coverage Design  
Section 319 - Interoffice Trunking and Signaling

- Section 325 - Application Guide for the Preparation of Detail Dial  
Central Office Equipment Requirements
- Section 415 - Transmission Objectives
- Section 511 - Telephone Traffic - Dial Equipment for Toll Centers
- Section 512 - Telephone Traffic - Manual Toll Board Equipment
- Section 520 - Central Office Equipment Switch Quantities (Large  
Central Offices)

1.07 To best meet the requirements for a particular office it may be desirable to deviate in certain respects from the general provisions contained in Part I. Such deviations will be stated in Part III and will supersede the requirements of Part I.

1.08 The paragraph numbers in this section conform to the item numbers of REA Form 542c.

## 2. BASIC INFORMATION

2.01 Originating Toll Messages Per Day Handled on Toll Board. This is the total of the messages originating at the toll center and at its tributaries which will be ticketed and timed at the toll board. For the toll center and the tributaries included in the ACD, the traffic studies in the ACD should show the toll messages per day per station and the number of stations, initially and at the end of ten years from which total messages can be calculated. For other tributaries a separate estimate is made by the borrower, if he owns them, or if not, an estimate is obtained from the connecting company.

2.02 Intertoll Trunks. Information on number of trunks and conversions to dial may be obtained from the connecting company owning the trunks.

2.03 Tributary Trunks. Exhibit C of the ACD shows the trunks between offices covered by the ACD for both the five-year and the ten-year periods. For other tributaries corresponding information can be obtained from the company that owns the trunks. The ten-year figures should reflect expected conversions of ringdown trunks to dial operation and the more liberal engineering schedule usually associated with this change.

2.04 Toll Distributing Frame. In most cases tributary and intertoll trunks are terminated on a separate vertical and horizontal of the local main frame. A separate toll frame must be provided where the toll office is in a separate building.

2.05 Trunking Diagram. Information for this item is obtained from Exhibit C of the ACD and in discussions with the connecting companies involved. Attached Figure 1 illustrates the type of diagram suggested.

2.06 Trunking Requirements. Each intertoll and tributary group terminating in the toll office is listed on this form. Separate columns are used for two-way, one-way in and one-way out groups. The purpose of this form is to show the trunk requirements at the toll center end. The requirements at the tributaries included in the REA project are covered in the corresponding REA Form 558c included in the "Specifications - Central Office Equipment Requirements" for the local offices. Attached Figure 3 illustrates how this form is filled out.

Lines 2 - 7. The number and type of operation of tributary groups included in the project are obtained from the corresponding forms included in the specifications for the tributaries. For other tributary groups and for intertoll groups the information is obtained through agreement with the connecting company that owns the trunks.

Lines 8 - 10 Usage. Both "Toll" and "EAS" are checked where both services are handled over the same group. "Special Service" is checked where assistance calls are handled over the group.

Lines 11 - 23. These items are filled in from information obtained from REA Form 558c, REA Form 810 and from discussions with the connecting companies that own the distant terminal.

Lines 24 - 30. These items are derived from the "Trunk Information" shown above. Reference to REA TE & CM-319 may be helpful in developing the figures. In exceptional cases it may be necessary to provide trunk equipment at distant offices where the local equipment is not included in the REA project. In this event the trunk equipment required is included in Lines 24 - 30, and an explanation is attached. Line 24 is the sum of the entries in Lines 2 - 7. Item 25, Repeating Coils, is the same as Line 24. Where it is uncertain whether or not coils are required, one should be specified for each trunk. If it develops later that all coils will not be needed, the excess may be returned or kept for maintenance or for future use. Line 26 shows the wired and equipped quantities of incoming selectors. The equipped quantity will be the same as shown in Line 24 for trunks equipped with incoming selectors. The wired quantity will exceed the equipped quantity only if additional selectors will be required in the near future. The figures in these lines, of course, should exclude any trunk equipment items to be supplied by connecting companies.

### 3. TOLL DIAL EQUIPMENT

A schematic showing quantities and arrangement of selectors and trunks can be developed as described in REA TE & CM-511. The requirements for transmission pads, impedance compensators and repeating coils can be developed as described in the American Telephone and Telegraph Company's "Notes on Distance Dialing - Section 6 - Transmission Considerations." Attached Figure 2 illustrates the type of schematic suggested for the toll dial equipment. This should be combined with the schematic for local dial equipment when one contract covers both.

### 4. TOLL SWITCHBOARD

Items 4.021 - 4.025 may be developed from the Basic Information as described in REA TE & CM-512. Eight cord pairs per position usually are specified unless there is reason to believe six would be adequate.

Item 4.026. Coin control on the switchboard is required only where prepay coin service is provided.

Item 4.027. Key sets are now used on most REA toll switchboards and usually only Item 4.0272 is checked. However, if a bid is desired for dials alone, Item 4.0271 is checked. Where key sets have access to two or more senders, standby dials need not be supplied. If key sets are specified, the dials will be used only for standby.

### 5. INFORMATION SERVICE

These items should be filled in whether the information and intercept traffic is to be handled on a separate information desk or on an end position of the toll board. Separate information and intercepting trunk groups generally are provided from the local dial office at the toll center but at tributaries these services usually are handled over the toll group or over an EAS group to the operator office.

5.01 Number of Positions Required. In most REA projects one position will be found adequate but in the larger toll centers, experience may indicate that more are required. In practice, operators at the first two or three positions usually handle both toll and auxiliary services.

5.02- 5.05. A minimum of two trunks in any group is suggested and more should be specified where there is reason to believe they are needed. Opposite "other trunks," Item 5.06, show any other groups, such as Repair Service, which should appear on the Information position. The derivation of intercepting trunk requirements is found in REA TE & CM-520.

### 6. TOLL TEST BOARD

Requirements vary widely depending on the number and type of intertoll trunks terminating in the office and on the arrangements made with the connecting company that owns the other terminals. In some toll offices the facilities provided for testing local equipment may be

adequate for the testing of intertoll trunks required of the REA borrower. It is suggested that this item be discussed with the connecting companies' representatives and agreement reached on what should be specified. Trunk testing facilities should be limited to those which are actually needed for the maintenance of interoffice trunks installed. Attached Appendix A lists the features that may be provided on a two-position local and toll test board.

#### 7. POWER AND CHARGING EQUIPMENT

Where one power plant is provided for both the local and toll offices, the estimated power requirements are shown in the Specification - Detail Central Office Equipment Requirements, REA Form 558c. If a separate power plant is to be used for the toll office this information is shown on REA Form 542c.

The current drain for the toll equipment may be estimated on the following basis:

Toll Switchboard - Per Position	2 Amps
Interoffice Trunk Terminated on a Selector	.3 Amps
Interoffice Trunk Terminated Only on the Switchboard or on the Banks of Selectors	.2 Amps

Power requirements are based on the estimated number of interoffice trunks and positions at the end of ten years as shown in Items 2.02, 2.03 and 4.022 of the Specification.

The 48-volt power required for carriers, repeaters and any other power-using items is estimated separately and added to the above.

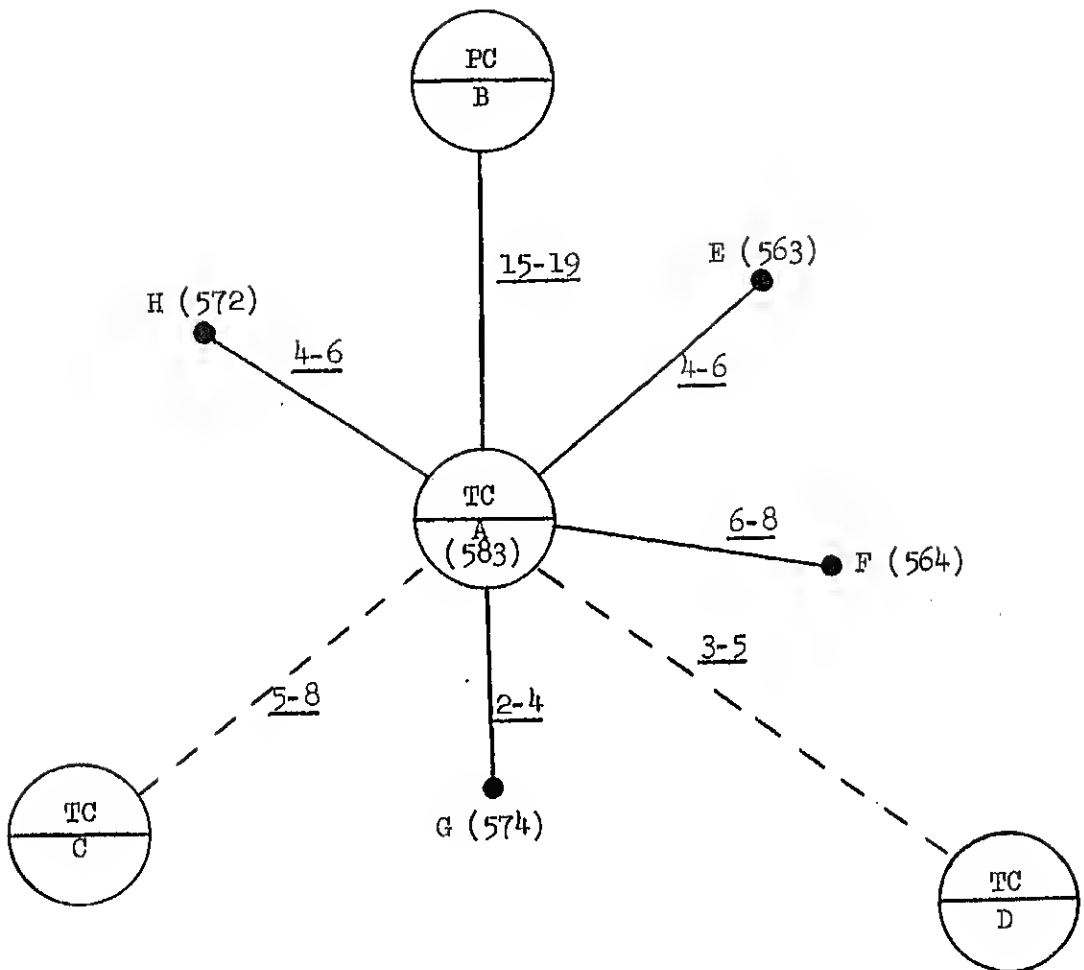
APPENDIX ATWO-POSITION LOCAL AND TOLL TEST BOARD

The testing facilities consist of two relay rack type positions. Position No. 1 is considered basic as a local test position and Position No. 2 is considered basic as a combined toll and local test position. Each position is equipped with a keyshelf. The following features are included:

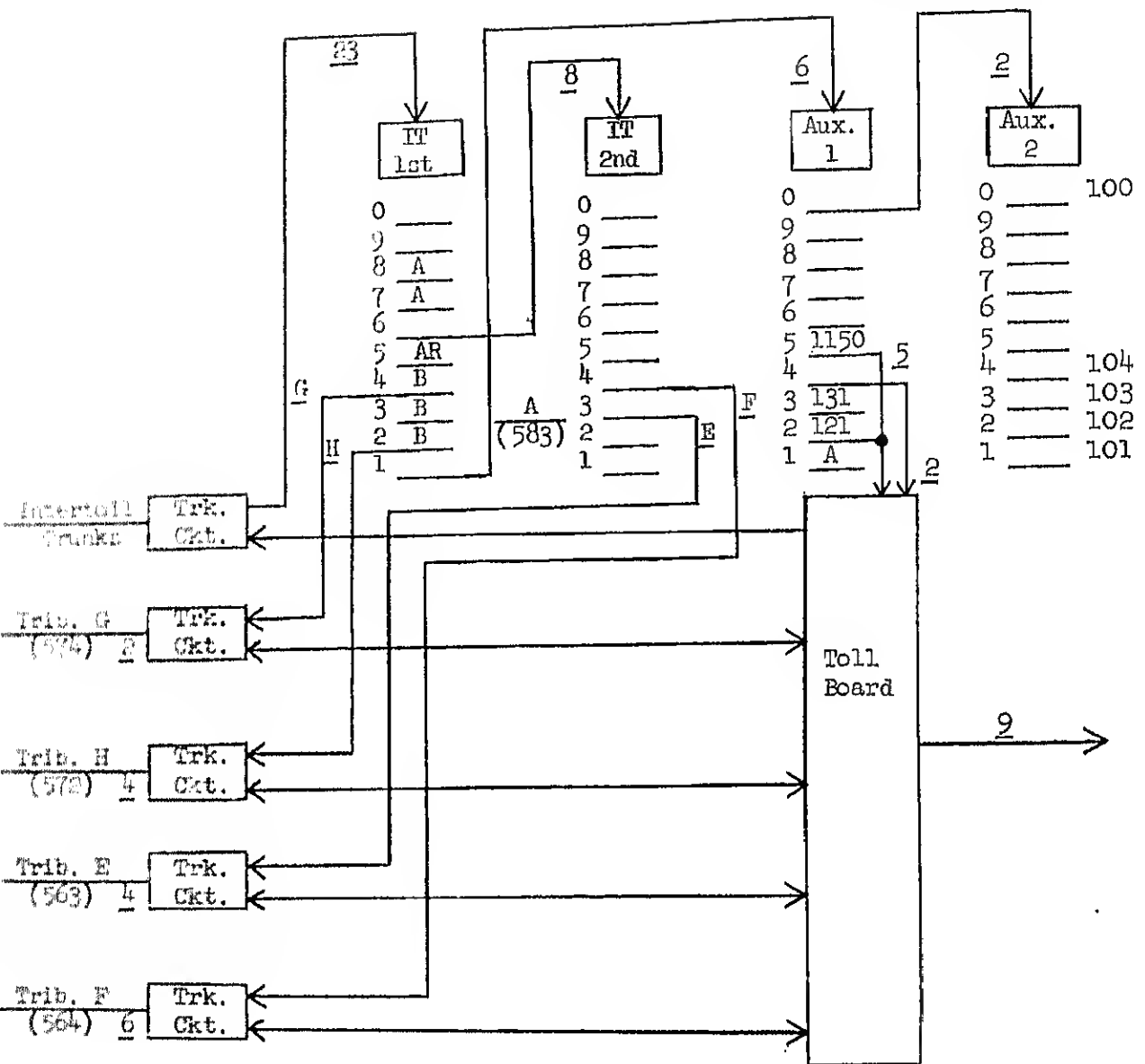
1. All test features specified in Item 3.02 of REA Form 558a using 150 volts d-c for testing battery.
2. Two operators' sets (one per position).
3. One handset and cord.
4. One combination volt-ohm milliammeter.
5. Two MDF test shoe circuits.
6. One MDF test clip circuit
7. Ringing key circuit.
8. Howler circuit.
9. Two trunks to test distributors.
10. Three incoming inspector trunks (Code 117).
11. Two local line terminations.
12. Two 2-way trunks to toll board, two 2-way trunks to information desk.
13. One dial speed and ratio circuit.
14. One Wheatstone Bridge.
15. One trouble tone circuit.
16. One oscillator test trunk (Code 102) (including oscillator with automatic start).

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Appendix A

17. One supervisory test trunk (Code 103) including flashing circuit.
18. One termination test trunk (Code 100).
19. One incoming service trunk (Code 101).
20. Test jacks as required.
21. Two operator chairs.
22. Patching cords.
23. One night alarm circuit
24. One sounder test circuit
25. One pad control circuit
26. One test circuit to toll board (cord test).
27. The toll test board shall be so arranged that convenient access over interoffice trunks may be provided to a transmission test circuit in the tributary offices. The test circuit in the tributary offices is designed so that if a certain designated connector terminal is dialed singly, access is provided to a one milliwatt supply of 1000 cps tone. If another designated connector terminal is dialed singly, access is provided to a termination consisting of a 900-ohm resistor in series with a 2 mfd capacitor for a "balance test" and noise measurement. Whenever both connector terminals are held simultaneously, both the milliwatt supply and the 900-ohm termination are lifted off and a loop around condition is established in the tributary office. This permits the overall loss to be determined from the toll office, going out over one trunk, looping around and returning over the other trunk. No equipment for making transmission measurements is to be provided in the toll office unless specified.



B - Primary Center (PC Class 3)  
A, C, D - Toll Centers (TC Class 4C)  
E, G, H - Dial Tributaries (Class 5)  
F - Manual Tributary (Class 5)  
\_\_\_\_\_ - Final Group  
- - - - - High Usage Group  
- ( ) - Office Code  
2-4 - Number of Trunks (Initial - 10 Year)



TOLL CENTER - TOLL SWITCHING SCHEMATIC

FIGURE 2



1	Group	Distant Office 2-Way, In or Out	Benton			Eden 2W	Frankl 2W
			2W	In	Out		

## TRUNK INFORMATION

TRUNK INFORMATION				4							
2	No. and Type of Operation Interoffice Trunks	Loop		5	5	5					
3		SX									
4		CX									
5		DX (E-M)									
6		Carrier (E-M)							6		
7		Ringdown									
8	Usage	Toll		✓	✓	✓	✓	✓			
9		EAS									
10		Special Service		✓	✓	✓	✓				
11	Type of Switchboard	Magneto									
12		Com. Battery	48 V						✓		
13		Manual	24 V					✓			
14		Dial									
15	Trunk Physical Characteristics	Com. Battery Toll		✓	✓	✓					
16		Loop Resistance		←	1725	→	400	41			
17		Gauge		←	104 40% CW	→	19	080 40			
18		Loading					H-88				
19	Supervision Loop Trunks	Length (K <sup>2</sup> )			350		25	5			
20		Rev. Battery					✓				
21		Rev. B. - Hi-Low									
22	Signaling SX and CX	Positive-Negative		✓	✓	✓					
23		E-M									
EQUIPMENT TO BE PROVIDED - NOTE				W - Wired						E - Equi	
24	Trunk Circuits - Total			W	E	W	E	W	E	W	E
25	Repeat Coils - Total			6	5	6	5	6	5	6	4
26	Incoming Selectors			6	5	6	5	6	5	6	4
27	Duplex Signal- ing Ckts. (E-M)	CX-SX		6	5	6	5	6	5	6	4
28		DX									
29	Composite Sets (CX)	Phantom Group									
30		Single Physical									

Note: If any trunk equipment is to be supplied at distant offices under this Specification, it is included in Items 24 - 30 and an explanation is attached.

## TRUNKING REQUIREMENTS

FIGURE 3